Research Councils UK Energy For a Low Carbon Future

SUPERGEN Bioenergy Hub

MAGLUE: **M**easurement and **A**nalysis of bioenergy greenhouse gases: Integrating **G**HGs into **L**CAs and the **U**K Bioenergy Value Chain Modelling **E**nvironment

University of Southampton

CEH Centre for Ecology & Hydrology
Natural Environment Research Council

Prifysgol Aberystwyth University

University of Aberdeen

Forest Research

Imperial College London

5 November 2014 – SUPERGEN HUB MEETING

Carbo-BioCrop

Aim: to understand processes determining soil carbon balances under perennial bioenergy crops




Ecosystem Land-Use Modelling & Soil C GHG Flux Trial (ELUM)

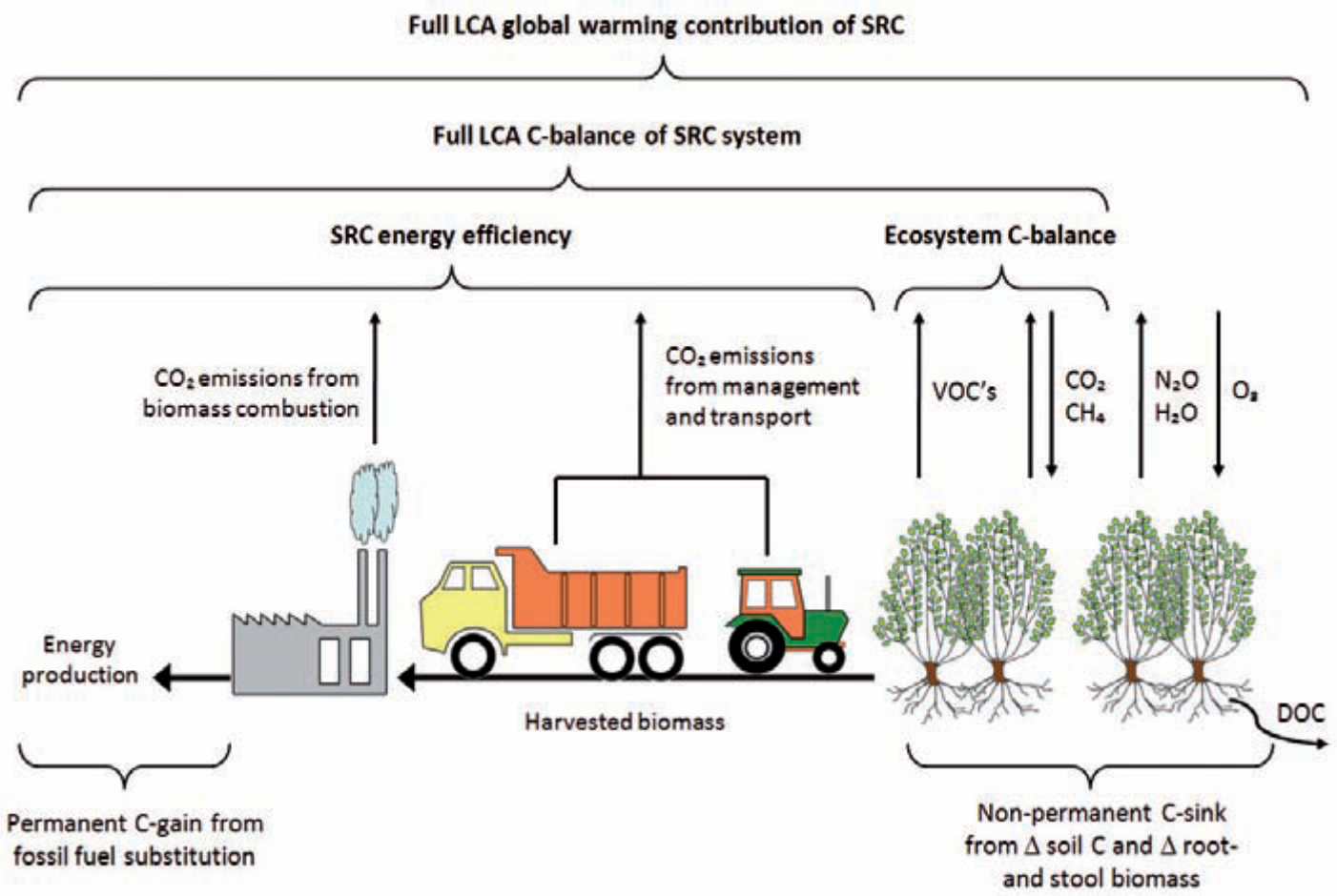
The ELUM Project is a seven-member Consortium project commissioned and funded by the Energy Technologies Institute (ETI).

The Consortium are partners are:

- Centre for Ecology and Hydrology (lead) – Niall McNamara
- University of Aberdeen- Pete Smith
- University of Southampton – Gail Taylor
- Forest Research- Mike Perks
- Aberystwyth University – Iain Donnison
- University of Edinburgh – Saran Sohi
- University of York- Phil Ineson

- The most comprehensive assessment of net C balance of bioenergy
- World-leading infrastructure for bioenergy land-use transitions
- Rigorous methodologies for bioenergy soil GHG measurements
- State-of-the art modelling of direct land-use change to bioenergy

Whole life cycle carbon analysis – there are remaining uncertainties



The POPFULL Project - http://webh01.ua.ac.be/popfull/docs/folder_POPFULL_ENG_comp.pdf

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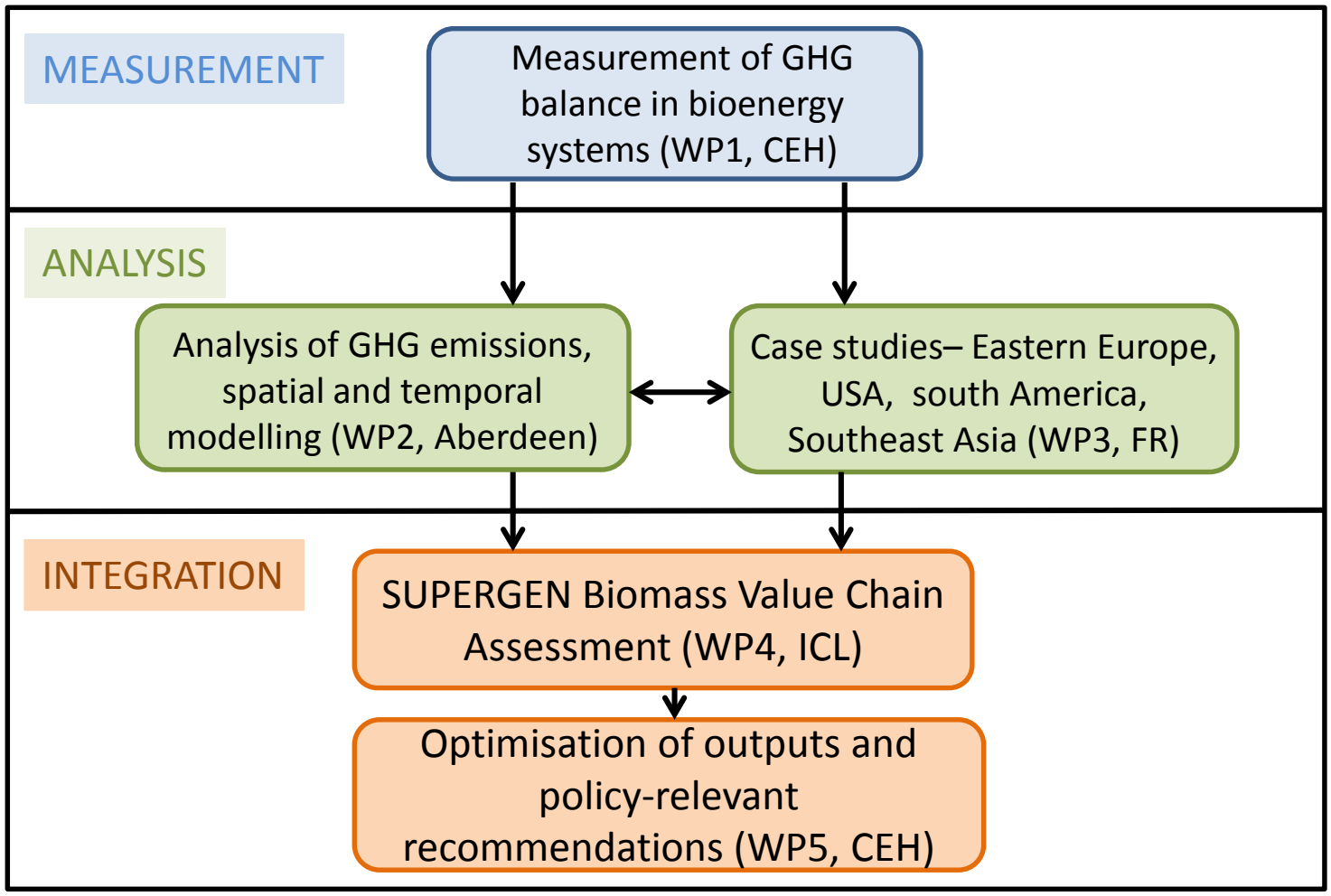
MAGLUE Consortium

Bringing together expertise, resources and analysis from Carbo-BioCrop and ELUM

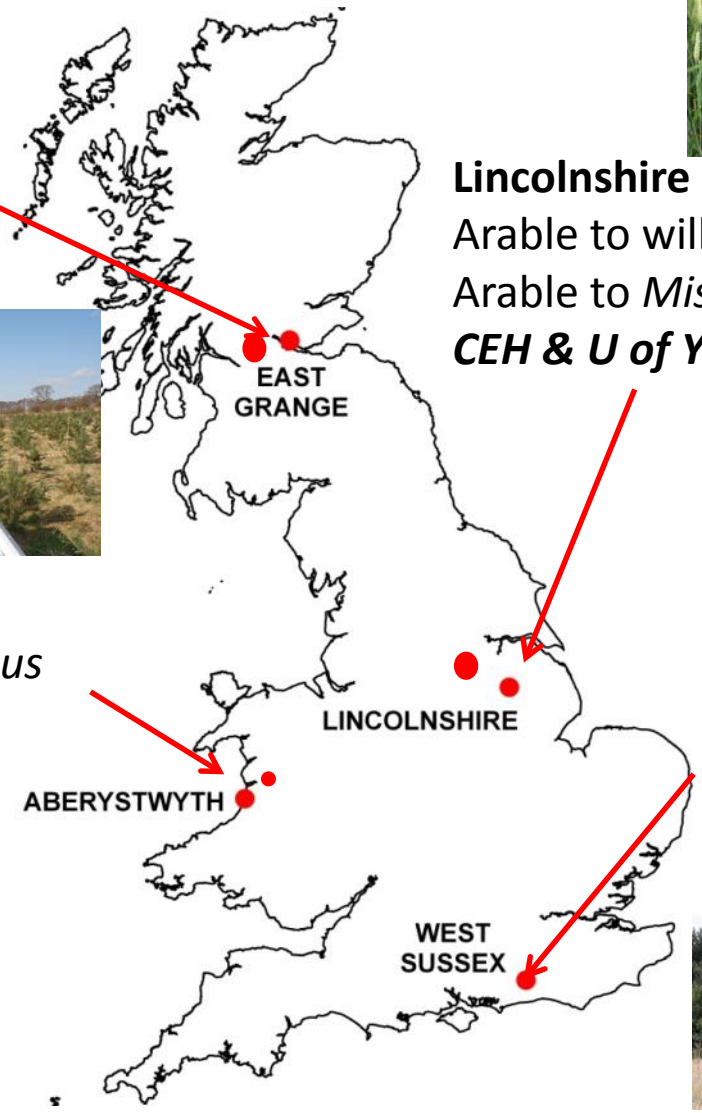
AIM: To understand the GHG balance of bioenergy systems and link to improved LCAs and technology options, for both UK-sourced and overseas feedstocks

MAGLUE – Work Package Structure



ELUM and Carbo-BioCrop Network Sites – empirical data from 2G crops and model validation

East Grange
Grass to Short Rotation Forestry
Forest Research
Arable to willow SRC
CEH Edinburgh



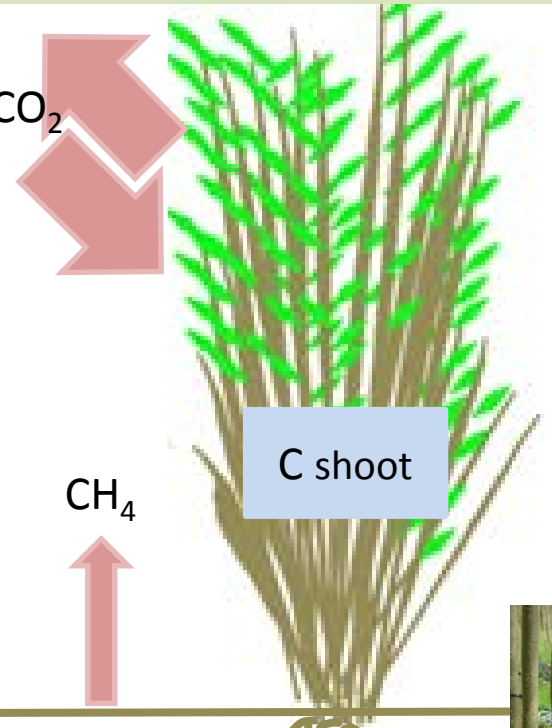
Lincolnshire
Arable to willow SRC,
Arable to *Miscanthus*,
CEH & U of York

Aberystwyth
Grass to Miscanthus
Genotype trial
U of Aberystwyth

West Sussex
Grass to willow SRC
U of Southampton

Understanding carbon cycling and GHG balance of 2G bioenergy crops

Eddy Covariance
Licor Open Path Li7500A
Windmaster
Full Campbell Met station with:
- NR Lite net radiometer
- Water content reflectometer
- Soil heat flux sensors
- Temp and Rh probe
- Quantum sensor
- Rain gauge
- Wind monitor

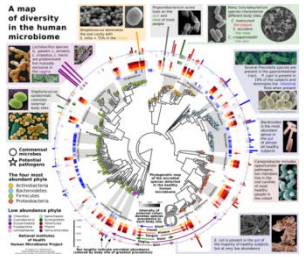


Standing biomass measurements
Annual above-ground measurements.
Below ground assessment.
Litter fall, crop removal

Static soil GHG measurements
Enclosure time: 50mins
4 samples taken using syringe
Analysis: Gas chromatography
n = 8 per land use

Dynamic soil respiration chambers
Autotrophic and heterotrophic respiration with trenching

Soil meta-bar coding and meta-genomics
To understand differences in diversity and function of the soil microbiome in relation to land-use and biochar



Carbo-BioCrop

www.carbo-biocrop.ac.uk

Integrating **G**HGs into **L**CAs and the **U**K Bioenergy Value Chain Modelling **E**nvironment

Analysis

Analyse the consequences of GHG changes for a range of bioenergy chains using:

- modelling framework for GHGs and soil carbon developed in the ETI ELUM project,
- Forest Research modelling expertise (North American Forests)
- SUPERGEN Whole Systems Analysis and Optimisation (SiM)

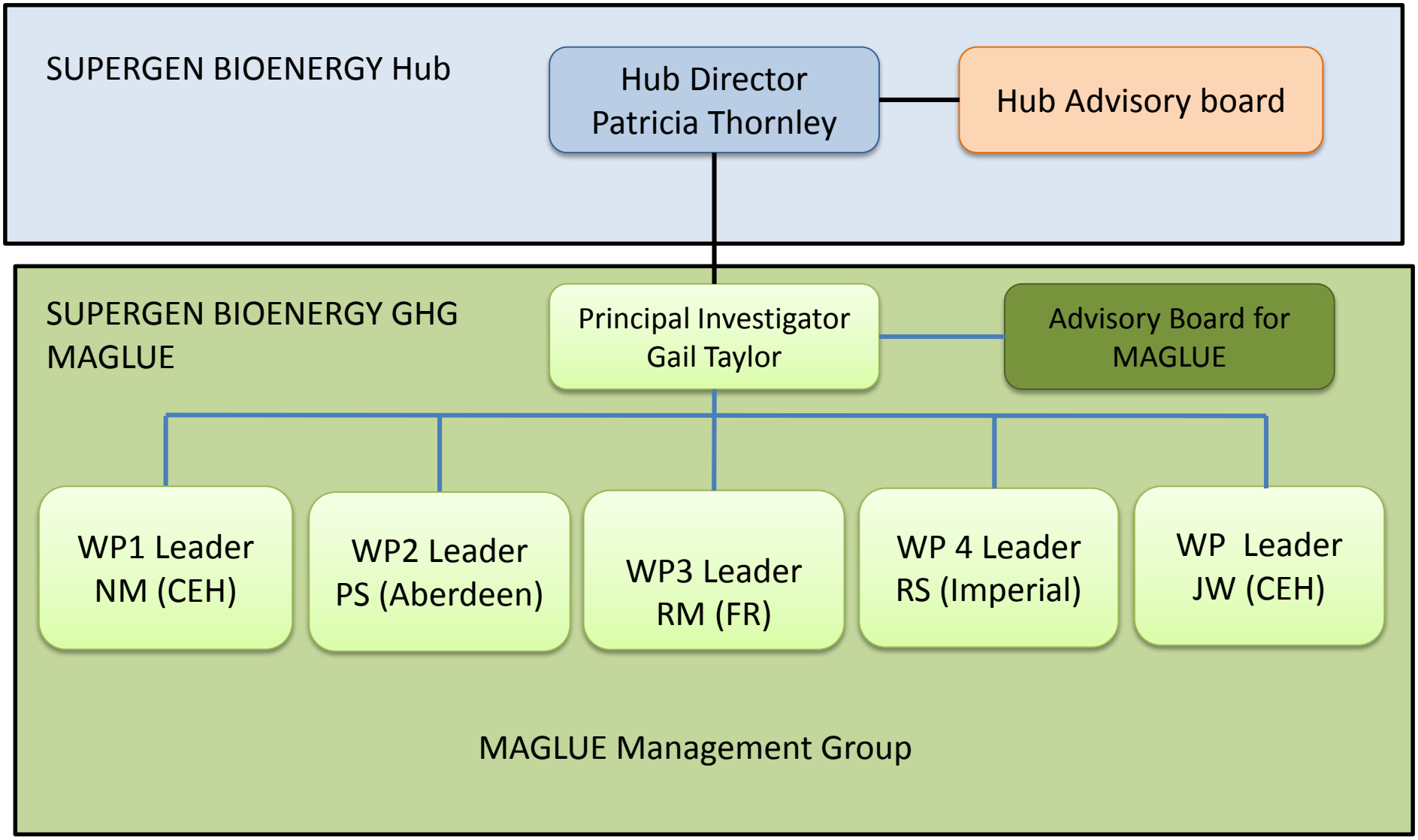
Integration

Work with stakeholder to ensure our modelling framework is developed to consider the most appropriate bioenergy chains and their impact on the UK energy system

Summary

- MAGLUE is a new three year project that will kick-off in Jan 2015
- MAGLUE is led by Gail Taylor, University of Southampton, partnered by Aberdeen, IBERS-Aberystwyth, CEH Lancaster, Imperial College London, Forest Research
- MAGLUE brings together resources from ELUM and CBC
- MAGLUE is valued at £1.2 M FEC

AIM: To understand the GHG balance of bioenergy systems and link to improved LCAs and technology options, for both UK-sourced and overseas feedstocks


SUPERGEN BIOENERGY Hub
Hub Director
Patricia Thornley
Hub Advisory board
SUPERGEN BIOENERGY GHG
MAGLUE
Principal Investigator
Gail Taylor
Advisory Board for
MAGLUE
WP1 Leader
NM (CEH)
WP2 Leader
PS (Aberdeen)
WP3 Leader
RM (FR)
WP 4 Leader
RS (Imperial)
WP Leader
JW (CEH)
MAGLUE Management Group